Issues in Ecosystem-based Measurement for the Georgia Basin-Puget Sound Region

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Abstract
Managing ecosystems that cross political and particularly national boundaries can benefit from common, or at least compatible, data and indicators. Transboundary reporting can also help bring shared environmental issues and their causes to public attention and thereby prompt policy and behavioural responses to the trends or conditions reported.

The first published set of transboundary environmental indicators in the Georgia Basin-Puget Sound region was released in May 2002, bringing to fruition a three-year process. An important aspect of the project beyond the report itself was understanding of the processes—scientific, institutional and personal—that enable—and inhibit—the production of a binational report. This paper will review some of the lessons learned and suggest some ways to move forward.

While, during the past decade, there has been a considerable amount of indicator development including interest in both standard environmental and broader sustainability indicators, there have also been many differences between data on the two sides of the boundary and even within each country. From an extensive list of potential indicators suggested at a gathering of Georgia Basin and Puget Sound experts in 1999 that had to be reduced for various technical reasons, the Ecosystem Indicators report dealt with a small selection of six indicators driven largely by data availability.

The development of a common set of indicators that could be integrated and reported side by side faced many hurdles. These included:

- Different and often incompatible approaches to environmental monitoring.
- Different institutional or governance goals, needs and responsibilities.
- Different legal frameworks on which management needs and monitoring are based.
- Different cultural contexts on both sides of the border.
- Limited capacity for a transboundary approach, especially for agencies whose mandates were constrained and subject to increasingly scarce resources.

The completion of this first report has resulted in a much better understanding of the various organizational, political and technical hurdles to be overcome to achieve ecosystem based reporting in the region. Challenging some conventional approaches and newly developed working relations across organizations have inspired those involved to continue breaking down barriers to the cooperative management of ecosystems that see no boundaries. The development of the report also sparked a stronger recognition of the value of seeing the indicators in a broader policy context, with concern for both past and future implications of environmental stresses in the face of the primary and continuing causal factors: population growth, consumption patterns and urban development.

Suggestions will be made on furthering the institutional capacity and effective working relationships to support the process. Another way forward may be to expand the scope of the suite of indicators to additional environmental and broader sustainability issues. Finally, a discussion of how to encourage informed decision making at all levels, based on this information will engage, the issues of the links between science, policy and decision-making, and effective reporting and marketing of the information products in order to encourage behavioural change.

Introduction

The theme of this paper is that management of ecosystems spanning political and especially international boundaries can benefit from the development of common or compatible data and indicators, including the processes required to develop them effectively. Transboundary reporting can help to bring shared environmental issues and their causes to the attention of government decision makers and the public in both countries, thereby prompting a desire for coordinated policy and behavioural responses. An important prerequisite is development of the capacity to work together and resolve challenging methodological and interpretation issues. The benefits justify the some times difficult process involved in resolving differences in data, regulatory and reporting systems, bureaucratic processes, cultures and even language.

We all recognize that natural ecosystems do not honour human boundaries, and that understanding whole systems requires the transcendence of such boundaries. It is not as widely recognized that improved understanding of those systems and the formulation of appropriate management responses paradoxically require data and analysis that (i) overcome the limitations imposed by jurisdictional boundaries, yet (ii) still function effectively within their own legal and social contexts that reflect the different ways in which we do business.

Transboundary ecosystem conditions and changes need to be reported in ways that can promote consideration of:

(a) Government and business policy initiatives and accountability, both within and between national/state/provincial/local jurisdictions.

(b) Improved understanding of the prime movers of change—the institutions, policies and human processes that define current notions of economic, environmental and social well-being.

In this regard, there are significant challenges in writing and following through on indicator reports in order to bring real value or relevance to them. This is true whether that value lies in potential governmental policy responses or in sparking appropriate behavioural changes in broader audiences, such as businesses and households, as will be discussed.

The First Georgia Basin-Puget Sound Report

The first published set of transboundary ecosystem indicators for the Georgia Basin-Puget Sound region was released in May 2002, bringing to fruition a three-year process of data and human capacity development.

Previously, there had only been a couple of tentative attempts to synthesize data at a transboundary scale in this region. The most advanced example was the development of regional salmon habitat indicators in the mid 1990's. Despite the novelty of the effort, there was a significant foundation for building the report. During the previous decade, there was considerable effort to develop specific indicators—both standard environmental and broader sustainability indicators—at various geographic scales. In some cases, our agencies use indicator trend data for ambient conditions to evaluate program and project effectiveness.

More comprehensive, ongoing indicator programs within individual jurisdictions include Environment Canada's Ecosystem Indicators, many pertinent to the Georgia Basin; the BC Government's Environmental Trends reports, the Puget Sound Action Team's Puget Sound Health Reports, the Washington State Department of Ecology's Environmental Health Report, and the U.S. Environmental Protection Agency's (EPA) draft *State of the Environment Report*, as well as a variety of efforts at the sub-regional scale by local governments and non-profit organizations.

The new report was the output of an extended, yet determined, process of bringing together disparate data, perspectives and individuals from these and other organizations to focus on the common task of producing an integrated report. For example, there were many differences in the form (scope and scale) of data on the two sides of the border and even within each country. Some detractors said a transboundary report could not be done, or at least would not be worth the effort. But the report did come to fruition, building with it a binational capacity to work together, and forming a strong foundation for future efforts in this area. Indeed, it may be that the most important aspect of the project, even beyond the report itself, was the development of a shared understanding of the complex processes—scientific, institutional, cultural and personal—that can inhibit—and yet ultimately enable—indicator development both within our individual processes and in a binational way.

A working group with membership from several agencies, and ultimately with involvement of more than 25 agencies, explored the potential for shared indicators of ecosystem quality and their communication to the public and decision

makers. From an extensive list of initial potential indicators generated in 1999, the working group winnowed the list down to six indicators based primarily on the ready availability of compatible data.

The resulting set of six published trans-boundary ecosystem indicators included:

- Population, distribution and projected growth.
- Solid waste generated and recycled per capita.
- Air quality trends based on exposure to Particulate Matter.
- Persistent organic pollutants in harbour seals.
- Terrestrial Protected Areas.
- Species at risk.

The report provides an overview of the transboundary region and then a detailed description of each indicator, with maps and/or graphs that integrate or compare data in the two countries.

The text explains:
WHAT is happening,
WHY is it happening,
WHY is it important,
HOW it compares with other areas, and
WHAT is being done about the situation?

The report then closes with a Section: WHAT CAN I DO? that provides web addresses and other information to assist readers in making personal, or organizational responses to the issues raised in the report.

[More details are available in the printed report available at the conference or at the web site:
http://www.pyr.ec.gc.ca/georgiabasin/reports/EnvInd_Report/GB-01-034_E.html]

The report has already contributed to a better understanding of the state of the regional ecosystem, and from that might be drawn some conclusions on required remedial strategies. This understanding extends beyond the individual indicators to larger problems related linking these issues and their causes. Significant drivers include population growth, the disruption of land cover and sensitive ecosystems for development, the widespread use of toxic substances and other "consumption" related issues. However, we have not yet addressed the follow through from the findings to required responses in a systematic way. This aspect of the reporting process is one that we suggest needs further attention in future.

Challenges in the Report Development Process

While there is general agreement on the main ecosystem or sustainability issues in the area and even, to some extent, on how to measure and report on progress, it is not easy to work across the international boundary. In addition to a general lack of experience in integrating data sets, a number of particularly challenging issues have faced scientists and policy analysts.

These hurdles included:

- **Different and often incompatible approaches to data.**
  These differences exist with virtually all aspects of environmental monitoring, from the design of the monitoring systems, to the parameters measured, time frames, terminology and analytical techniques used, and the even the definition of basic terms and issues. Even if the numbers look similar, it is important to ensure that they are indeed comparable and that the underlying assumptions and methodologies are compatible. There are at least four stages where compatibility issues can arise:

  1. Design of monitoring networks—broad ambient or hot spots.
  2. Temporal factors—frequency, time of year (temperature).
  3. Analytical protocols—e.g. running vs. simple averages, compound vs. simple rate of change.
  4. Size and scale of reporting areas/polygons (watershed vs. eco-region which may be defined differently), and boundary issues.

An example is the approach to mapping terrestrial protected areas. The geographic scales of reporting units also differed so that, initially, the U.S. looked much worse than Canada but only due to a statistical artefact.

It was also significant that much of the area protected, notably in the US, was in high altitude, steep sloped, locales. In both countries the amount of land designated in protection categories is very underrepresented in the lower altitude, more highly populated and more ecologically productive areas.

- **Different institutional or governance goals, needs and responsibilities.**
  The time line and purpose of collecting data can be different, and these differences can be reflected in the form of reporting. For example, in some cases data emerge from short term or even project specific scientific research in one jurisdiction, while they may be linked to periodic monitoring for specific regulatory or legal requirements in another. While it is sometimes possible to construct indicators from raw data, it may involve a significant time commitment from researchers in the face of competing demands. At the same time, differing priorities might mean that a different emphasis or priority may be placed on the work involved.

- **Different legal frameworks.**
  Differing management needs in each jurisdiction and the environmental monitoring on which they are based can hamper reporting data in the same way because of differing regulatory requirements. This was the case with reporting air quality standards and the degree to which they were met.

- **Different cultural contexts.**
  Cultural differences occur with respect to the role of government reports and even public involvement. In writing the report, one cultural issue raised was the different interpretation of whether promoting certain behaviours was a form of advocacy. Divergent views also arise from the perspectives of the individual workgroup members and supporting technical staff. People come into these projects with different goals, backgrounds and perspectives, both personal and institutional. Individual world views are also shaped by the participants' professional training. In some cases, senior management wanted the report done so staff responded though perhaps without great enthusiasm given their other workload. For others, the idea of working on such a project was energizing, and represented a change from normal workloads, or was seen as just the right thing to do.

- **Low priority for a transboundary approach.**
  In some agencies, the project sometimes seemed to have low or fluctuating priority, especially for the state and provincial agencies whose mandates are constrained by jurisdictional borders and subject to increasingly scarce resources. These types of projects may be seen as being nice to do, but low on the urgency scale because most technical and policy staff have over-full agendas already, and managers may not see this work as central to the missions of their organizations, despite the fact that monitoring and outreach/education are central to all of the agencies' missions.

  In other cases, it may be that key staff have simply never worked together and are not immediately equipped to forge easy working relationships with colleagues in other jurisdictions.

- **Data availability.**
  Any or all of these factors may contribute to the core difficulty that compatible data are simply not available in a way that can readily be reported in an integrated fashion, nor are resources readily mobilized to correct that deficiency.

Capacity Development

Fortunately, in the Georgia Basin/Puget Sound experience, the presence of agreements between Canada and the U.S., as well as BC and Washington, provided a basis for recognizing and treating the basin as one ecosystem with similar issues. This encouraged indicator practitioners to come together, formulate and act on a vision and develop the capacity to work on a common project.

Completion of this first report has resulted in a much better understanding of the organizational, political and technical hurdles for ecosystem based management in the region, including ways to overcome those hurdles. Challenging conventional approaches and developing working relations across organizations have inspired those involved to break down barriers to transboundary reporting and management. There was also a conscious effort to see the individual indicators in a broader context, with concern for both past and future implications of environmental stresses in the face of continued population growth and land conversion in the region.

Our initial transboundary effort was initially pragmatic, that is, based on availability of data, resulting in significant gaps. We will need to develop indicators for the next report for which additional data collection or analysis will be needed to forge comparable data sets. On the contrary, the report does not claim to be comprehensive—indeed there are some very notable gaps, particularly on the subject of water, as the process was driven by availability of data and short-term analytical capacity. How to decide what gaps to fill is one of the challenges ahead. Unlike many national and multinational projects, no time was spent in the initial project to build a framework into which the indicators were organized.

There is value, however in focusing increased attention on a more formal framework in order to ensure a reasonable range of key issues that are of concern to decision-makers including the public. In principle, the fundamental building blocks for such indicator frameworks might be based on:

1. A conceptual/ theoretical model for organizing the data, usually based on a view of how the system (e.g. economy or ecology) functions and the interrelationships between the components.
2. A set of policy drivers emanating from public debate, political priorities or regulatory requirements.
3. Expressed information needs of stakeholders / consumers / "public."

As we look at the gaps, and gain more experience and broader engagement beginning at this Conference, the scope of future reports may evolve into a more systematic one, including other ecosystem indicators, leading to broader sustainability frameworks for reporting ecological **and** human well-being in the region.

Getting Value From the Report

The report is attractive and has been given good reviews by agency managers and staff, and a number of other local organizations, but it had limited press coverage (though Canadian Geographic and Environmental News Network provided coverage). It is likely that it has yet had a real impact on decisions by environmental managers and the public, in terms of changing policies and individual or collective behaviour. Yet, this is what the report cries out for, in terms of its findings such as:

- Recycling trends, despite initial improvements have levelled off and overall municipal solid waste is increasing due to population growth and trends towards higher consumption in many critical areas.
- Air quality (PM10) was reported to have improved but other problems such as air toxics exist that threaten public health. We now understand PM 2.5 is a more critical indicator of air quality, and overall emissions are outpacing technological improvements. There is continuing increased use of inefficient vehicles and "off road" sources.
- Toxic levels in marine mammals remain unacceptably high due to continued pollution, indeed PCBs levels have remained fairly constant over 14 years although traditional point sources have been controlled.
- Terrestrial protected areas have increased, surpassing overall policy objectives, but are seriously under represented in critical low elevation, shoreline and floodplain areas.
- High percentages of certain species are at risk, with the number and distribution of species at risk correlated with the highly developed parts of the basin.

One issue is that the production of the first report was not accompanied by a systematic or well- developed communications strategy regarding the results, especially one aimed at developing new policies or practices to effect behavioural change. While this was a longer-term process than we were able to address, and would have had to involve persons other than those in the working group, we feel a compelling need to take the analysis further. This would include developing "stories" that would resonate with readers at different levels of literacy and responsibility.

Some of the Working Group members have been asking, what's the point of reporting indicator data if it stops at mere reporting? Where is the value added or the potential realized from these efforts? How do we encourage a different attitude or ethic towards improving environmental and human conditions reflected in the indicators? How do we link the science/information to behaviour change?

Lessons Learned and Conclusions

We can draw a number of conclusions from the experience of developing this report.

- There is a steep learning curve and challenges to integrating data—part science, part diplomacy, part personal determination, and plenty of humour and good will. The group needs to identify sensitive issues early and work them through, notably with respect to the "message" to the audiences to which the report is addressed.

- There is value in functioning within a clear Terms of Reference.

- Identify the intended audience(s) up front, find out what they need and how to present the information to them in a way that shows connections, resonates with their values and is more likely to lead to behavioural and policy changes. Figure out whom you are writing to and write to that audience. If you have more than one audience, you may have to provide several products, each tailored to a particular group.

- Identify both internal and inter-agency processes to secure commitments to the binational work with clear leadership from each partner, including for coordinating and mobilizing data and human resources. (Written commitments are seen by some as essential, although for some participating agencies, falling below the radar screen's formality worked better. Where to trade off this issue has been one of the challenges facing the working group.)

- Clarify and work through differences in the scientific, policy, political and communications perspectives between and within the partners.

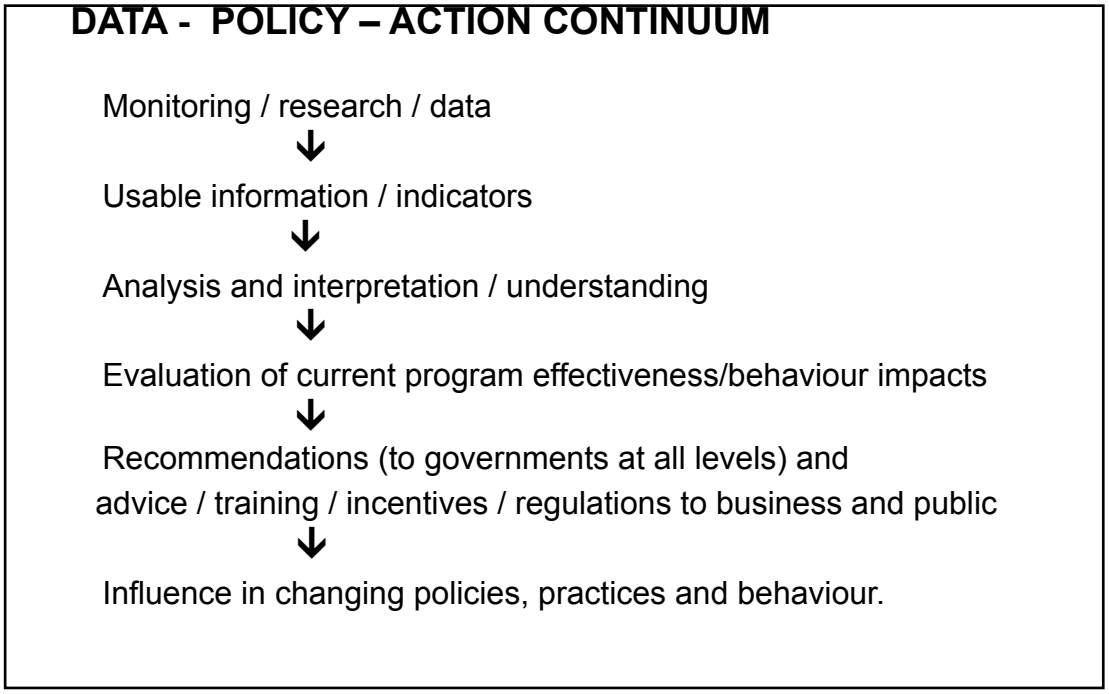
- Build personal relationships to ensure trustful and cooperative working relationships that allow participants to connect easily and resolve issues quickly. A major part of the success of the project lay in building on some established relationships but also in developing new working and personal relationships that proved to be invaluable as a form of "social capacity". This requires a significant amount of personal contact though there are efficiencies (email, teleconferences) to supplement it.

- Consult with communications and marketing expertise early and throughout the process (but do not bring report production "technicians" in too soon). By involving communications we mean much more than preparing to churn out press releases and mailing reports, but the thoughtful analysis of the following continuum of informational and behavioural relationships: It is also necessary to develop stories that will be seen as newsworthy, so that the popular media will diffuse the report's messages and help capture community attention. As earlier indicated, media response was limited particularly in the region where the information is most relevant.

- Recognize the importance of an extended continuum for moving from information to change. Historically, we have tended to seek behaviourial change by publishing information in reports, technical bulletins, Q&A documents, or web sites. Each of us writes from our world view— the manner in which we view, interpret and see the world around us, shaped by personal experience, cultural norms, and professional training. The science worldview is only one world view, however, and alone is not capable of changing behaviour. That is why it is so important to pair vividly written stories about science with behavioural change tools in order to facilitate securing personal commitments, removing barriers to change, shifting social norms, providing incentives and reinforcing desired behaviour. (See the web site http://www.cbsm.com for more details on "community-based social marketing," or CBSM.)

In summary, the benefits of this transboundary indicator process through which we have traveled lie not only in producing an interesting report, but, also importantly, in having gained broader knowledge and understanding that can be applied to future projects of this nature. We have developed capacity in four major areas:

1. Understanding the data gaps and technical issues, as well as data strengths and limitations.
2. Understanding procedural, cultural, and legal differences between jurisdictions and disciplines, including the role of advocacy and public involvement.
3. Building trust and relationships.
4. Writing and analysis for results.



Where Do We Go From Here?

The Working Group has continued to meet and consider further next steps in three broad categories of activity:

1. Strategically distributing the existing report further, including the possibility of other formats such as a pamphlet and web links.
2. Use improved procedures to secure and refine commitments, including a new Terms of Reference, as well as to capture lessons learned, web-based working space, analysis of report implications and weighing agency priorities vs. potential indicators, etc.
3. Identify additional indicators to include in the report, planned for late 2004. This includes the potential for adding broader "sustainability" indicators that reflect links between community well-being, the environment and economic development in addition to the more traditional environmental indicators.
4. Examine the composition of the membership including policy/social science disciplines, including expertise that can link to broader consultation and support outside the working group.

In the next round, the Working Group will confer not only with specialists within the members' own agencies but also with outside experts and a broader public audience to select indicators, and gather advice on how to use the information gleaned from the report to encourage behaviour change and hence, ultimately, improved ecosystem conditions.

The first step towards developing our next set of indicators is a workshop at this Conference (2003 Georgia Basin-Puget Sound Research Conference, Session 5A) at which a range of scientists from various disciplines and audience participants will discuss indicators for the following topics:

- Surface water quality.
- Marine water quality.
- Shellfish contamination.
- Land use and land cover.
- Municipal water use and capacity.

Conclusion

Most participants in this project found it to be worthwhile and satisfying. There is a high degree of interest in continuing with this transboundary work, and in filling some of the gaps and other shortcoming of the initial effort. The response from senior management has been universally positive, though not translated explicitly into policy actions to date.

To amplify the impact of this and subsequent reports, it is important to ensure that indicator trends, other findings and the analysis of their potential consequences are effectively communicated to, understood by, and acted on by a range of decision makers ranging from senior government and business leaders, to local decision making bodies, to the individual consumers. Governments at all levels including municipal councils and planning units, the business community, activist organizations and individual families and citizens, all make daily choices in purchasing, transportation, choosing locations for development, materials use and disposal, and that can have astounding consequences throughout the ecosystem.

The ultimate challenge ahead, therefore, is in taking data and indicators, and weaving compelling stories that resonate with readers, and show connections between their choices and environmental conditions on which they can have an impact. We also need to develop tools to help decision makers, communities, businesses and citizens make better decisions that sustain quality of life, not quantity of life. We can only do that when we begin to link—with our actions and policies—the relationship between natural resource protection, economic development and community well-being.

We believe that some of the answers will lie in:

- Doing a better job collaborating with other professions, agencies and organizations, often those that we don't normally work with.
- Capturing the attention of policy makers so that they will assess and act on the implications of reported trends.
- Placing much more emphasis on integrating communications considerations early in the process including a targeted, well thought out strategy—in particular a media plan—that can trigger "reportable" community action.
- Helping communities focus on the issues and develop their own solutions to local problems, showcasing them as part of a long term communications/outreach strategy.
- Showing linkages between human activities / decisions and other components of the ecosystem.
- Rediscovering quality and joy in community, reshaping the values upon which we will grow in this region, and where appropriate, celebrating success as a community.

The road is long, but open to all travelers.